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(54) **Edible products**

(57) An edible product, primarily for human consumption, is made by mixing finely milled BSG (brewers' spent grains), containing at least 50% moisture by weight, with a binding agent and cooking the resultant mix to form the product. The BSG may contain between 60% and 80% moisture and be milled to fineness such that more than half of the milled material can pass through a 1 mm sieve but be retained on a 0.5 mm sieve. The binding agent may consist largely of starch, which may be pregelatinized. The mix may be formed into lumps or extruded before being cooked, and cooking may be effected by such methods as deep-frying and oven-cooking.

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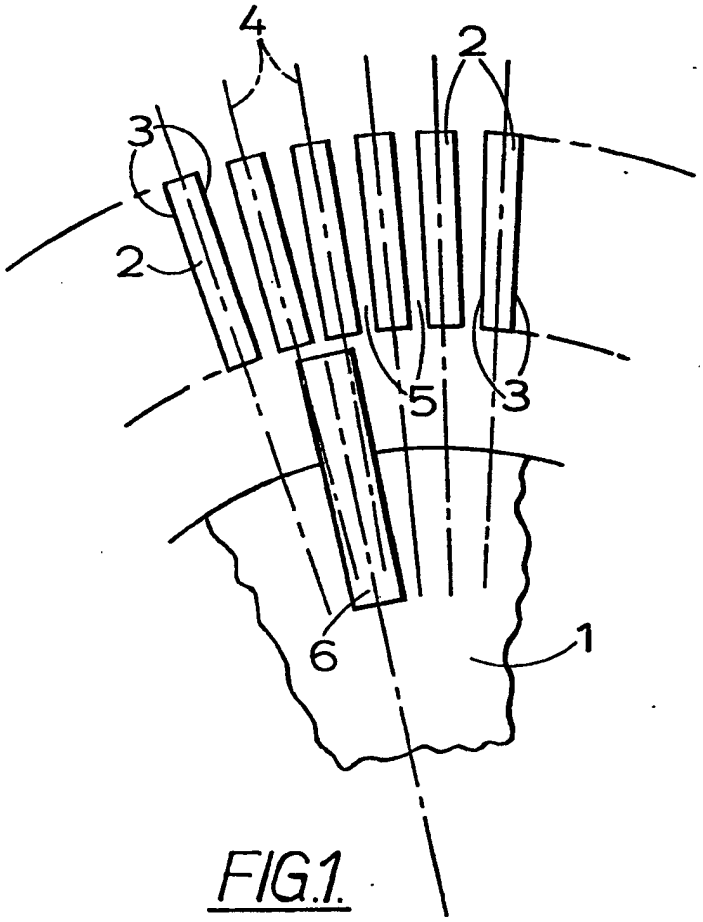

FIG.1.

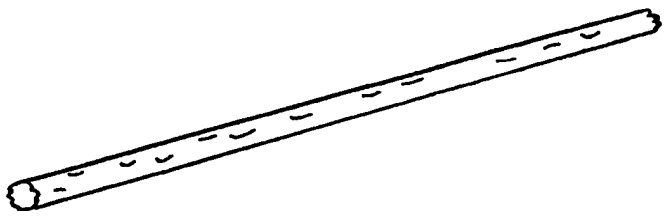

FIG.2.

FIG.3.

SPECIFICATION
Edible products

This inv ntion relates to edible products, and is concerned both with methods of manufacturing edible products and with the products themselves. The edible products with which the invention is concerned are primarily but not exclusively intended for human consumption.

In the manufacture of edible products in accordance with the present invention use is made of brewers' spent grains (hereinafter usually referred to as BSG). BSG is a by-product of conventional brewing processes and comprises barley malt from which the hydrolysed starch and water-soluble proteins have been removed in the course of a brewing process. It thus consists mainly of barley husks and other fibrous material together with proteinaceous material. Both types of materials are valuable dietary constituents; in particular, while the dietary value of proteins has been known for many years, it has more recently been appreciated that fibrous materials are also important in a well-balanced diet.

Various attempts have been made to develop edible products incorporating BSG, but none of them has been particularly successful. An aim of the present invention is to provide an improved method of producing edible products making use of BSG.

From one aspect the present invention comprises a method of making an edible product comprising the steps of finely milling brewers' spent grains (BSG) containing at least 50% moisture by weight, combining the milled BSG with a binding agent to form a mix and cooking said mix to form an edible product.

From another aspect the present invention consists in an edible product made by the method outlined in the last preceding paragraph.

It is envisaged that the product will generally be in the form of a coherent body, the shape of which is at least largely predetermined; nevertheless the product may be of powdered, granular or other particulate form such that the shapes of the individual particles are not predetermined.

A particularly significant feature of the present invention is that it involves the use of BSG that is relatively wet. As a byproduct of a brewing process BSG normally incorporates a high proportion of water, typically between 60% and 80% water by weight. BSG when wet is relatively unstable and therefore cannot be simply stored for extended periods without spoiling. It has therefore been customary to reduce considerably the moisture content of BSG before it is used for other purposes. Further, it has hitherto been thought to be essential to reduce considerably the moisture content of BSG before it is milled for incorporation in edible products. In methods previously described the water content of the BSG was reduced below 20% before milling. An advantage of the present invention, therefore, is that it avoids the need for a relatively costly drying process before the BSG is milled.

Nevertheless, where the BSG has a high water content, for example a water content of greater than about 70% by weight, it may be desirable to remove some of the water from the milled BSG before it is incorporated in the mix. The water content of the milled BSG may, for example, be reduced to about 70% by weight. One method of reducing the water content is by pressing the milled BSG between sheets of absorbent paper, while another method is by centrifuging the milled BSG.

Numerous methods of milling are employed in milling dry materials but not all of those methods are effective in milling relatively moist BSG. In some known methods of milling dry materials blades are caused to pass rapidly through the materials. Those methods are usually ineffective with the relatively moist BSG that is used in carrying out the present invention as the blades tend to slide through the BSG without cutting it. Similarly, the use of abrasive grinding stones, caused to rotate relatively to each other, is often ineffective with moist BSG as the material tends to clog the stones with the result that they are unable to grind satisfactorily. It has now been discovered, however, that milling can be effected when use is made of a milling machine incorporating one or more cutting blades and means operative to transport the BSG positively to the cutting blades. This is in contrast to machines in which the BSG is transported merely under its own weight. In one method of milling use is made of a milling machine marketed as the Comitrol 1700 and made by Urschel International Limited of Leicester, England. In this machine the BSG is positively transported to cutting blades by centrifugal action. In another method use is made of a milling or mincing machine, employing a 2 mm screen, marketed under the name Hobart by The Hobart Manufacturing Company Limited of Crawley, Sussex, England. In this machine the BSG is positively transported to cutting blades by means of a feed-screw.

Various methods of treating the BSG before milling have been investigated, such as boiling, pressure cooking, freezing and the addition of a fine dry powder such as starch or soya flour, but none of them has improved the milling significantly, or enabled otherwise unsuitable milling methods to be employ d. As no such pretreatment appears to be of significant valu and would be likely to add to the expense of the finished product, it is preferred not to subject th BSG to any such pretreatment before milling.

A significant proportion of BSG consists of material, such as husks, that is of a fibrous nature. In consequence products embodying the present invention may tend to have a fibrous mouth-feel when eaten, the extent to which a fibrous texture or feel is noticed being dependent on a number of factors, a principal on of which is the fin n ss of the milling. The degree to which a fibrous mouth-f el is acceptable is, of c urs , entirely subjective but nevertheless it has been found in consum r tests that

products that are widely acceptable to eat incorporate milled BSG which, on sieve analysis, is found to contain no more than a trace of particles greater than 1.4 mm across, that is particles retained on a sieve with apertures of 1.4 mm diameter. Further, it is preferred to employ milled BSG of which the major proportion by weight passes through a sieve with holes of 1 mm in diameter but is retained on a sieve with holes of 0.5 (500 μm) in diamet r. In a particularly preferred material between 60% and 65% of the mat rial by weight is of that size.

Another factor which affects the general acceptability of the products is the proportion of finely milled BSG in the mix from which the products are made. If there is a predominance of relatively coarse particles it may be desirable to employ a lower proportion of BSG than when the BSG is milled more finely. In practice, however, the upper limit may often be determined by the need or desire to include other materials in the mix. There would normally be a sufficient quantity of binding agent to enable a coherent body of substantially predetermined shape to be formed, this amount being readily ascertainable by simple experiment. In addition to the binding agent it may also be considered desirable to include material affecting the flavour and/or the colour of the products. These would normally be present in amounts not exceeding 10% by weight of the mix. In general it is preferred to employ no more than 70% by weight of the finely milled moist BSG in the mix, and more preferable to employ no more than 65% thereof. Many acceptable products include between 55% and 65% by weight of finely milled moist BSG in the mix. It is to be understood that here as elsewhere in this specification proportions of finely milled BSG by weight include the weight of the moisture present in the BSG after it has been milled.

Any suitable binding agent may be employed. The binding agent may be constituted by a single material or by a mixture of two or more materials. The following materials have been employed, singly or in mixtures, as binding agents: starch, corn flour, soya flour, soya grits, soya isolate, sodium alginate, carboxymethylcellulose, gelatine, glucose syrup, sugar, egg albumin, milled bran, and milled textured vegetable protein.Where the binding agent comprises starch, the starch may be pregelatinized. This may be effected, for example, by heating the mix at about 100°C for about 15 minutes. Proprietary modified starches that have been found to be satisfactory are "Dri Bond", marketed by Laing National Limited of Trafford Park, Manchester, England, and "Baka Snak", a maize starch that has been pregelatinized and conforms to E1422, also marketed by Laing National Limited.

A preferred binding agent comprises a mixture of pregelatinized starch and soya flour. This mixture may be used alone or with the addition of other binding agents.

It is necessary to form the mix into some kind of shape before it is cooked. It is possible to subject the mix to heat treatment, so as to pregelatinize starch in the mix or to reduce the moisture content of the mix or for both purposes, before the mix is formed into shape. In general, however, it is preferred not to subject the mix to any such heat treatment before the mix is shaped.

In general it is found best to cook the mix in a form in which it is relatively thin; in particular it is preferred to cook the mix in a form in which its thickness is not more than about 10 mm. The mix may be shaped to form a relatively extensive sheet or lamina, but the mix is preferably cooked after it has been so shaped as to be of restricted size in at least two dimensions at right angles to each other. Thus it may be shaped as strands, strips or filaments, or as lumps. For example, in one method the mix is formed into strips some 60 mm long, 5 mm wide and 5 mm thick. In another method the mix is formed into pieces about 20 mm by 20 mm by 5 mm. In another method the mix is formed into lumps of random shape each of very approximately 1000 mm^3 in volume.

Another method of forming a mix, and one that is particularly preferred, is to extrude it through a die. The die is preferably in the form of a tube of uniform cross-section. Conveniently, the cross-section of the die is circular. The diameter of such a die may be in the range 2.9 mm to 6.4 mm, though the invention is not of course restricted to the use of sizes within that range. The extruded strand of mix is preferably cooked before being cut into suitable lengths. The final products may be about 100 mm in length.

Any of a number of different methods of cooking the mix may be employed. A method particularly preferred is to cook the mix in an oven; the temperature in the oven may be about 150°C. Other methods of cooking that may be employed are deep-frying in hot fat or oil, cooking under reduced pressure, cooking by contact with a heated plate or heated plates, and cooking a mix that is shaped by extrusion by passing it through a heated tube constituting or adjacent to the extrusion die. Combinations of methods may be employed.

Deep-frying tends to produce products which retain significant amounts of fat and which may therefore be rather less attractive than some products cooked by other methods. In a typical method, portions or lumps of mix are deep-fried in an edible vegetable oil by immersion in the oil, which has been heated to about 200°C, for a period of in the range of from 30 seconds to 90 seconds. It may b found to b d sirabl to r mov xcess fat or oil from th products after they have been cooked, particularly when they hav been cooked by deep-frying.

Cooking under reduced pressure may be eff cted after initial heating to pregelatinize any starch present and may assist in th rapid removal of moisture from the mix. Wh n it is desired to obtain an expanded product of relatively low moisture content it may be appropriate to cook the shaped mix under reduced pressure, for example at a pressure of about 25 inches (635 mm) of mercury. Oil may

conveniently be used to heat and cook the shaped mix. In practice it is generally found that the shaped mix puffs up as the moisture is withdrawn, but that there is a tendency for the puffed products partially to collapse when restored to atmospheric pressure.

Attempts have been made to cook the mix as it is extruded through a tube, but it has been found that in general such a method is insufficient on its own and that additional cooking, such as by deep-frying, is desirable. In experiments, the mix was passed through a tube of 2.9 mm internal diameter and 203 mm long, the tube being heated to temperatures within the range 235°C to 285°C.

Cooking by contact with a heated plate or heated plates can yield products somewhat similar to potato crisps. The temperature of the plate or plates may be between about 150°C and 240°C. If necessary the shaped mix may be pressed onto the heated plate or plates to ensure good contact therewith. The lumps or other portions of mix may be turned from time to time as may appear desirable. If desired the portions or lumps may have oil or fat applied to them before or during cooking, so that they are in contact with a thin layer of film of oil or fat while being cooked.

Likewise, where the mix is formed by extrusion the same or similar methods of cooking may be employed, though it may be difficult to cook extrusions of circular cross-section by contact with a heated plate or plates.

If desired, cooking may be effected by a combination of methods. For example, a mix that is shaped by extrusion may be partially cooked by being heated in a tube constituting, or adjacent to, the extrusion die. This method may well be useful when followed by an additional cooking process such as deep-frying or oven-cooking but is not normally suitable for use as the sole cooking process. In another method, extruded mix is oven-cooked and then deep-fried.

It may happen that owing to the high moisture content of the BSG itself or of another ingredient or other ingredients of the mix, or owing to the addition of water to the mix, the mix may require to be partially or wholly dried before being cooked. Drying is preferably effected when the mix has already been shaped into lumps, portions or by extrusion; but it is nevertheless possible to heat the mix to remove some of the moisture from it before it is formed into the desired shape or shapes. The removal of moisture from the mix would normally be effected by heating the mix, and in some circumstances the application of heat to the mix could both serve to reduce the moisture content and to cook the mix or at least partially to cook the mix. In a typical method the mix, either before or after being shaped, is wrapped in metal foil and heated in an oven at about 100°C, for a period of between 5 and 15 minutes.

The shaped mix, whether in the form of lumps, cut portions or an extrusion, may be partially or wholly coated with an edible material or edible materials before it is cooked or at least before the final stage of cooking. Flavours in powdered or liquid form may be applied to the shaped mix, powdered flavours often being particularly effective. Various other materials may be used to coat the mix, such as soya grits, soya isolate, soya flour, farina, milled bran and sodium alginate. If desired, mixtures of materials may be used, such as a mixture of sodium alginate and farina or a mixture of soya flour, sodium alginate and farina. In each instance the sodium alginate is preferably in the form of a 4% solution. The formed mix may be coated with oil prior to cooking. This oil-coating may be additional to one or more other coatings such as those outlined above. The use of a coating of oil tends to lead to an increased crispness of the final product and may increase the extent to which the product expands during cooking. The oil, which may be a vegetable oil, is preferably sprayed onto the formed mix. It will be appreciated that the coating of the mix with oil prior to cooking is desirable only when the mix is cooked by a method, such as oven-cooking, that does not itself involve contact between the mix and oil.

The methods outlined above are some of the possible methods of carrying the invention into effect. It will be appreciated, however, that not all of those methods will necessarily result in the production of edible products that are found in tests to be pleasant for consumption by humans. Nevertheless it will also be appreciated that it is relatively simple to carry out experiments to identify those products that are generally acceptable and pleasant to eat.

It has been found that acceptable products can be produced with a mix containing, by weight, about 60% milled BSG with a moisture content of about 70%, and about 30% pregelatinized starch, the remainder being constituted by one or more other edible materials, such as binding agents, flavours, in liquid or powdered form, colouring materials, and salt. The mix can be cooked by any suitable method such as one or more of those outlined above. A method that has been found to be particularly satisfactory is oven-cooking at an oven temperature of about 150°C.

The present invention can be used to produce edible products of a wide range of kinds, suitable for a variety of markets. The invention may, for example, be used in the production of snack foods which may be eaten, in place of potato crisps or as snacks, with alcoholic drinks. Alternatively the products embodying the invention may be sold as breakfast foods, or where suitably formulated, as health foods. Yet again, the products may be formed as biscuits, that is either as sweet biscuits or as savoury biscuits intended to be eaten alone or with cheese or other savoury foods. (Biscuits are usually referred to as cookies in the U.S.A.).

It is envisaged that additives may be incorporated in or added to products embodying the present invention in order to alter their taste. Salt may be incorporated or added, as may flavouring materials such as malt extract, yeast extract, vinegar, and materials having flavours such as salt and vinegar, pizza, beef and onion, ham, cheese and onion, fried onion, curry, etc. A preferred method is to mix the

powdered flavour or flavours with the dry ingredients before they are mixed with the moist milled BSG. Alternatively or in addition it may be desirable to dust powdered flavour or flavours onto the shaped mix before the mix is cooked. Where appropriate, flavouring materials may be sprayed onto the products.

There follow some examples of experiments carried out to assess different types of methods and products embodying the invention. The examples are selected from numerous experiments to illustrate the wide variety of procedure and constituents that can be employed. The resulting products are in each instance edible, but are not necessarily of a kind likely to be widely acceptable and attractive to the public at large. It will be appreciated, however, that acceptability is a subjective matter and that the comments given in the examples are merely those of few people. Further, in many instances no additives were used to modify the taste of the products.

In the accompanying drawings,

Figure 1 is a diagrammatic plan view of the blades and an impeller of a preferred form of milling machine for use in carrying out the present invention,

Figure 2 is a perspective view of one form of product embodying the present invention, and

Figure 3 is a perspective view of another form of product embodying the present invention.

Referring first to Figure 1, this illustrates the operative parts of a milling machine of the kind marketed as the Comitrol 1700 and referred to above. The milling machine comprises a generally cylindrical vessel with its axis vertical and a rotor 1 inside the vessel, which rotor can be rotated at high speeds about the axis of the vessel. Inside the vessel, and co-axial with it, is a ring of fixed blades 2 made of tungsten carbide, each of which is in the form of a plate with parallel main faces 3 in vertical planes. The central plane 4 of each of the blades 2 is radial with respect to the axis of the ring. There is a narrow gap 5 between each blade and the next. The rotor 1 carries a plurality of impellers 6 at uniform intervals around its periphery (only one impeller is illustrated). Each impeller comprises a radially extending vertical blade, the outer edges of which pass very close to the fixed blades 2 as the rotor rotates.

In use moist BSG is fed to the rotor 1 and flung positively outwards against the fixed blades 2 owing to the rotation of the rotor. BSG carried around the ring of fixed blades 2 by an impeller 6 is brought against successive blades very rapidly. For example, if there are 160 fixed blades 2 and the rotor 1 rotates at 8000 rpm the BSG will be brought up against the fixed blades at a rate of more than 20,000 per second. In use the BSG is cut or milled by its contact with the leading edges of the blades against which it is forced, the milled material then escaping through the gaps 5 between the blades 2.

A mincing or milling machine of the kind marketed under the name Hobart, as referred to above, is not illustrated herein as it is of a well-known kind comprising a rotatable feed-screw operative to transport the moist BSG to a fixed screen against which there lies a rotatable cutting plate which in use cuts or mills the BSG.

There follow, by way of example, analyses of the particle size of two samples of moist BSG milled with the aid of a Comitrol 1700 milling machine, the grain in each instance being subjected to two passes through the machine. On the second pass use was made of a milling head giving a finer cut than that given on the first pass. The BSG had a moisture content of 79% by weight and the milled BSG was subjected to wet sieve analysis.

Size range of Particles	Percentage-Sample 1	Percentage-Sample 2
> 1.4 mm	Trace	—
1.0 mm—1.4 mm	5.98	Trace
710 μm—1.0 mm	31.5	37.9
500 μm—710 μm	31.1	24.9
355 μm—500 μm	11.3	17.4
180 μm—355 μm	14.6	14.3
63 μm—180 μm	5.07	3.72
38 μm—63 μm	0.46	1.82

EXAMPLE 1

BSG containing about 80% moisture was milled using a mincer of the kind marketed under the name Hobart and with a 2 mm screen. A mix was prepared comprising th following constituents by weight:

milled BSG	61.5%
farina (potato starch)	30.8%
carboxymethylcellulose	7.7%

The mix was shaped to form pieces, each about 20 mm by 20 mm by 5 mm, and these were deep-fried in vegetable oil at 199°C. The resulting products tasted somewhat fibrous but were pleasantly crispy. A typical product of this kind is illustrated in Figure 3.

EXAMPLE 2

BSG was milled as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	30%
sodium alginate (4.0% solution)	40%
farina	30%

The mix was shaped to form small lumps, each of about 1000 mm^3, and these were deep-fried, as in Example 1. The resulting products were of an acceptable texture though somewhat oily.

EXAMPLE 3

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	50%
glucose syrup	25%
farina	25%

The mix was formed into pieces, as in Example 1, and these were cooked in an oven at 150°C. The resultant products tasted sweet but somewhat fibrous.

EXAMPLE 4

The procedure outline in Example 3 was followed, using a mix comprising the following constituents by weight:

milled BSG	44.4%
egg albumin	11.11%
glucose syrup	22%
farina	22.2%

The resulting products again tasted sweet but somewhat fibrous.

EXAMPLE 5

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	58.8%
egg albumin	11.76%
farina	29.4%

The mix was formed into pieces, as in Exampl 1, and these were deep-fried in oil at 199°C. The resulting products tasted somewhat fibrous.

EXAMPLE 6

The proc dur outline in Example 5 was followed, using a mix comprising the following constituents by weight:

milled BSG	50%
sodium alginate	25%
milled textured vegetable protein	12.5%
farina	12.5%

The resulting products again tasted somewhat fibrous.

EXAMPLE 7

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	31.3%
sodium alginate	37.5%
farina	25%
soya isolate	6.25%

The mix was extruded through a die of 2.9 mm internal diameter to form a long strand of mix which was coated with soya isolate and deep-fried in oil at 199°C. The strand was cut to length after being cooked, and the resulting products had a crisp texture. A typical product of this kind is illustrated in Figure 2.

EXAMPLE 8

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	45%
sodium alginate	30%
farina	20%
soya isolate	5%

The mix was dried for 15 minutes at 100°C and was then extruded through a die to form a strand which was deep-fried in oil. Dies of two different internal diameters were employed, one of 2.9 mm diameter and the other of 6.4 mm diameter. The strands were cut to length after being cooked, and the resulting products were in each instance found to be well puffed but of a fibrous texture and oily.

EXAMPLE 9

BSG containing about 80% moisture was milled using a milling machine of the kind marketed as the Comitrol 1700 and described above with reference to Figure 1. A mix was prepared comprising the following constituents by weight:

milled BSG	45%
farina	6%
sodium alginate	31.5%
corn starch	16%
salt	1.5%

The starch was pregelatinized by heating the whole mix in a vessel maintained at 100°C for 15 minutes. The mix was then dried for 20 minutes at 100°C and cut into strips about 50 mm by 5 mm by 5 mm. The strips were then deep-fried in oil. The resultant products were crisp.

EXAMPLE 10

Milled BSG was produced, as in Example 9, and a mix was prepared comprising the following constituents by weight:

milled BSG	45%
farina	37%
sodium alginate	9%
soya flour	8%
salt	1%

The starch was pregelatinized as in Example 9, and the mix was extruded through a die to form a strand which was then deep-fried in oil. Dies of two different internal diameters were used, one of 2.9 mm diameter and the other of 6.4 mm diameter. The cooked strands were cut into short lengths, and the resulting products were crisp and acceptable to taste.

EXAMPLE 11

Milled BSG was produced, as in Example 9, and a mix was prepared comprising the following constituents by weight:

milled BSG	50%
Baka Snak starch	40%
soya flour	10%

The mix was formed into lumps of approximately 1000 mm^3. The lumps were coated with oil and cooked on a hot plate at about 240°C. They were pressed down onto the hot plate with a spatula, which reduced them to about 1.5 mm in thickness, and were turned occasionally. The cooked lumps were then dried at 60°C. The resulting products were very light and crisp.

EXAMPLE 12

Milled BSG was produced, as in Example 9, and a mix was prepared comprising the following constituents by weight:

milled BSG	60%
Baka Snak starch	30%
soya flour	10%

The mix was formed into lumps, as in Example 11, and were coated with oil. They were then cooked between two hot plates, of which the bottom plate was maintained at 180°C and the top plate at 210°C. The resulting products were acceptable to eat.

EXAMPLE 13

A mix was produced, as in Example 12, and was extruded through a die with an internal diameter of 2.9 mm. The resultant strand of mix was cooked in an oven at 150°C for 10 minutes and then cut into lengths. The resultant products were found to be very acceptable to eat.

EXAMPLE 14

Products were produced in a manner similar to that outlined in Exampl 13, but instead of the constituents including 10% soya flour they included 9.2% soya flour and 0.8% salt. The products were again very acceptabl to eat.

EXAMPLE 15

Products were produced in a manner similar to that outlined in Example 14, but the mix was extruded through dies of different internal diamet rs, s m being extruded through a die of 3.5 mm

diameter and some through a die of 3.18 mm diamet r. In each instance the extruded strand was cooked for 20 minutes rather than 15 minutes. The products were again very acceptable to eat.

EXAMPLE 16

Milled BSG was produced, as in Example 9, and a mix was prepared comprising the following constituents by weight:

milled BSG	70%
Baka Snak starch	20%
soya flour	10%

Part of the mix was extruded through a die of 2.9 mm diameter and another part of the mix was extruded through a die of 3.18 mm diemeter. The strands so produced were oven-cooked for 10 minutes and 20 minutes respectively. The resultant products were found to be slightly fibrous when eaten. Somewhat similar results were obtained when the soya flour was omitted and replaced by Baka Snak starch.

EXAMPLE 17

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	62.5%
soya grits	31.3%
farina	6.25%

The mix was extruded through a die and partially cooked in a tube co-axial with the die aperture. The tube was heated to 235°C and the mix was resident in the tube for 31.8 seconds. The partially cooked strands were then fried in deep fat at 199°C. The resulting products were found to be acceptable to eat.

EXAMPLE 18

Milled BSG was produced, as in Example 1, and a mix was prepared comprising the following constituents by weight:

milled BSG	56.6%
gelatine (30%)	28.3%
farina	14.3%

The mix was shaped and cooked as in Example 1.

EXAMPLE 19

Milled BSG containing 73% moisture by weight was produced using a Comitrol 1700 milling machine, and a mix was prepared comprising the following constituents by weight:

milled BSG	63.2%
Baka Snak starch	31.6%
soya flour	3.16%
cheese powder	2.11%

To 30 gm of that mix was added 0.3 ml liquid yellow colour. The mix was extrud d through a die, dusted with a powdered mixture of a cheese flavour and salt and then oven-cooked at 150°C.

EXAMPLE 20

Milled BSG contained 68% moisture by weight was produced using a Comitrol 1700 milling machine, and a mix was prepared comprising the following constituents by weight:

milled BSG	60%
Baka Snak starch	30%
pizza flavour	8%
soya flour	1.25%
salt	0.75%

To 30 gm of that mix was added 0.3 ml liquid yellow colour. The mix was extruded through a die. Half of the extruded strand was sprayed with oil and the other half was not so treated. The strand was then oven-cooked at 150°C.

CLAIMS

1. A method of making an edible product comprising the steps of finely milling brewers' spent grains (BSG) containing at least 50% moisture by weight, combining the milled BSG with a binding agent to form a mix and cooking said mix to form an edible product.

2. A method according to claim 1 in which the BSG is milled with the aid of a milling machine incorporating one or more cutting blades and means operative to transport the BSG positively to the cutting blades.

3. A method according to either of claims 1 and 2 in which the BSG contains between 60% and 80% water by weight.

4. A method according to any one of claims 1 to 3 in which the milled BSG contains no more than a trace of particles that can be retained on a sieve with apertures of 1.4 mm diameter.

5. A method according to any one of the preceding claims in which the milled BSG is such that a major portion by weight can pass through a sieve with holes 1 mm in diameter but is retained on a sieve with holes 0.5 mm in diameter.

6. A method according to any one of the preceding claims in which the proportion of milled BSG in the mix by weight (measured as wet weight) is not more than 70%.

7. A method according to claim 6 in which the proportion of milled BSG in the mix by weight (measured as wet weight) is not more than 65%.

8. A method according to any one of the preceding claims in which the proportion of milled BSG in the mix by weight (measured as wet weight) is not less than 55%.

9. A method according to any one of the preceding claims in which the mix is shaped before being cooked so that it is not more than 10 mm thick.

10. A method according to claim 9 in which the mix is shaped into individual lumps or pieces before being cooked.

11. A method according to claim 9 in which the mix is extruded through a die to form strands which are subsequently cooked.

12. A method according to claim 11 in which the die is not less than 2.9 mm and not more than 6.4 mm in diameter.

13. A method according to any one of the preceding claims in which the mix is cooked, at least partly, by being deep-fried in hot oil or fat.

14. A method according to any one of claims 1 to 12 in which the mix is cooked, at least partly, in a heated oven.

15. A method according to any one of the preceding claims in which the binding agent comprises one or more materials selected from the following: pregelatinized starch, starch, corn flour, soya flour, soya grits, soya isolate, sodium alginate, carboxymethylcellulose, gelatine, glucose syrup, sugar, egg albumin, milled bran and milled textured vegetable protein.

16. A method according to any one of the preceding claims in which the mix also includes at least one additive serving to affect the flavour or the colour of the product, the total weight of such additive not exceeding 10% by weight of the mix.

17. A method of making an edible product substantially as hereinbefore described in any one of th Examples.

18. An edible product made by a method in accordance with any one of the preceding claims.

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